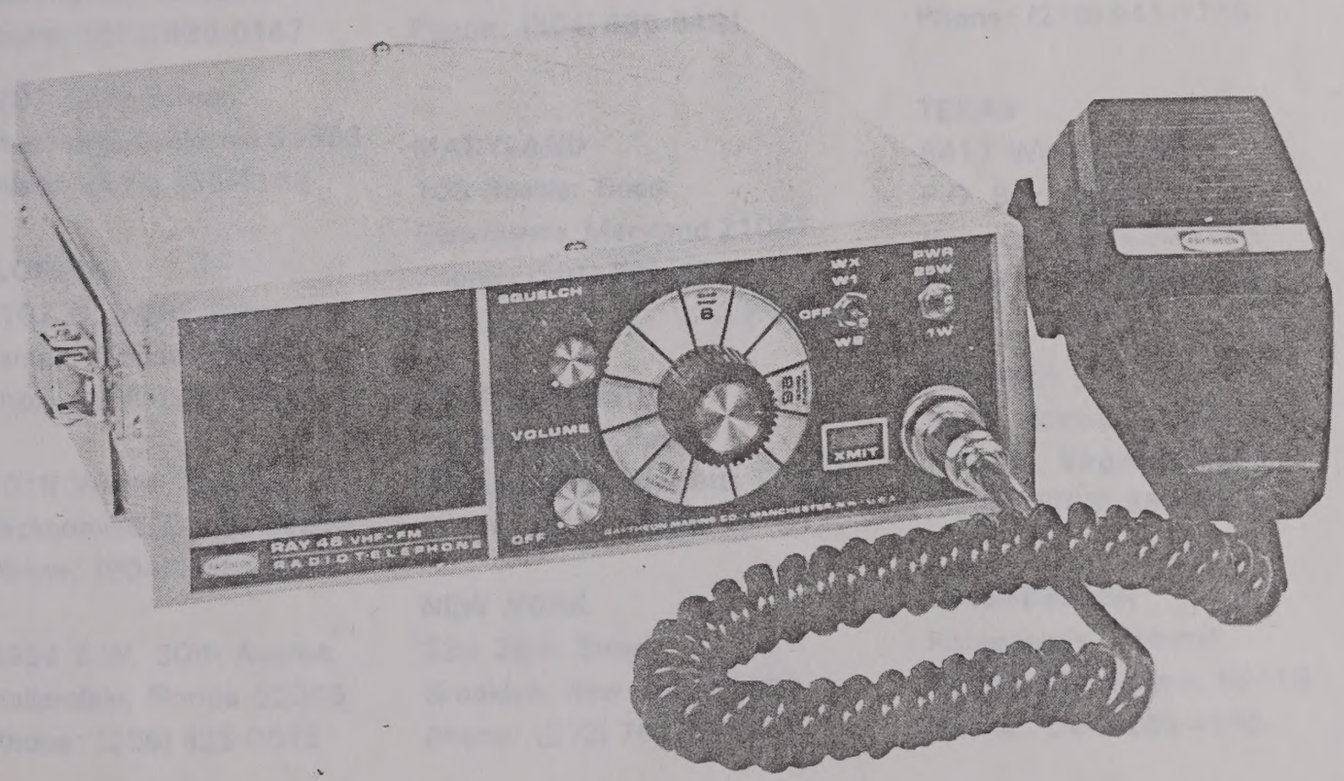
INSTRUCTION MANUAL
FOR
MODEL
RAY 48

VHF—FM
RADIOTELEPHONE



RAYTHEON MARINE COMPANY
676 ISLAND POND ROAD MANCHESTER, NEW HAMPSHIRE 03103

PURPOSE

THIS MANUAL CONTAINS IMPORTANT INFORMATION ON THE INSTALLATION, OPERATION AND MAINTENANCE OF YOUR EQUIPMENT.

Should your Raytheon marine equipment ever require service, contact the dealer from whom it was purchased, or the nearest Raytheon marine dealer in your area.

Raytheon offices are located in the cities listed below, and are prepared to assist you if any questions or problems arise concerning Raytheon marine equipment.

FACTORY SERVICE FACILITIES

CALIFORNIA
633 N. Marine Avenue
Wilmington, California 90744
Phone: (213) 835-0147

1707 64th Street
Emeryville, California 94608
Phone: (415) 655-4152

FLORIDA
1107 N. Ward Street
Tampa, Florida 33607
Phone: (813) 877-9418

2018 Walnut Street
Jacksonville, Florida 32206
Phone: (904) 354-0333

2956 S.W. 30th Avenue
Hallandale, Florida 33009
Phone: (305) 925-0072

LOUISIANA
525 Jefferson Street
New Orleans, Louisiana 70121
Phone: (504) 835-6491

MARYLAND
103 Roesler Road
Glen Burnie, Maryland 21061
Phone: (301) 761-4300

NEW ENGLAND
65 Cummings Park
Woburn, Massachusetts 01810
Phone: (617) 935-6710

NEW YORK
239 26th Street
Brooklyn, New York 11232
Phone: (212) 768-2511

OHIO
3076 W. 117th Street
Cleveland, Ohio 44111
Phone: (216) 941-7716

TEXAS
8417 Winkler Drive
P.O. Box 12334
Houston, Texas 77017
Phone: (713) 644-8043

VIRGINIA
6419 Tidewater Drive
Norfolk, Virginia 23509
Phone: (703) 853-4610

WASHINGTON
Fishermen's Terminal
Seattle, Washington 98119
Phone: (206) 283-4895

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1.2 CONTROLS AND FUNCTIONS

Figures 1-1, 1-2 and table 1-1 illustrate and describe the functions of the front and rear panel controls and indications.

Table 1-1 Controls and Indications

Index	Circuit Symbol		Function
1	SP	Speaker	Built-in, 8-ohm, 1-watt speaker.
2	VR101	SQUELCH	Rotates to select threshold of background noise rejection.
3	PL2	Pilot lamp	Indicates power ON condition and illuminates the channel selector.
4	S2	Weather channel selector W1/OFF/W2	Selects either of the two available ESSA weather channels. When selected, the weather channels over-ride all other channels.
5	S3	Power switch 25W/1W	Provides for low or high power transmissions, depending on operating conditions or legal requirement.
6	J3	Microphone connector	The microphone supplied with the unit plugs into this connection.
7	PL1	Transmit indicator	Illuminates when transmitter is keyed (push-to-talk button depressed)
8	S1	Channel selector switch.	Selects any of 12 individual transmit or receive channels.
9	S4/ VR103	VOLUME/OFF	This control performs two functions: ON-OFF and VOLUME. When the control is moved in a clockwise derection, the unit is energized, and the audio output is increased.
10	J1	Antenna connector	Antenna input.
11	J4	Power connector	The DC power cord furnished with the unit plugs into this connector.
12	J2	External speaker Jack	A remote 8 ohm speaker can be connected to this jack. The audio output of this jack is 4 watts. maximum.

1.3 SPECIFICATIONS

Transmitter

Channels	Twelve, with crystals for 6 and 16 furnished.
Frequency stability	.001% −20° to +50°C (ship station) .0005% −20° to +50°C (shore station)
Crystal type	SPECIAL. Use only the special, temperature-contoured crystals designed for this unit. Other crystals may drift beyond the legal FCC limits.
Power output	25 watts into 52 ohm load, reducible to 1 watt.
Modulation	Phase modulated 16F3 (±5 kHz deviation for 100% modulation)
Modulation limiting	Instantaneous, automatic at 100% modulation.

1. INTRODUCTION

1-1 GENERAL

This radiotelephone is designed to provide years of reliable operation with a minimum of attention, whether used for pleasure or commercial purposes. Several of the units' outstanding features are:

1. All solid-state circuitly for low current drain, minimum heat dissipation and maximum reliability.
2. A high-performance receiver with greater selectivity for operation in "noisy" or "busy" areas.
3. Two separate weather channel.
4. Twelve individual transmit/receive channels.
5. 3 watts audio output provides adequate volume even in a noisy environment.
6. Quick disconnect bracket. Allows unit to be removed quickly for safe storage when not in use.

The radiotelephone purchase includes a mounting yoke, and crystals for ESSA weather channels (W2) as well as crystals for channel 6, (ship-to-ship communication in "safety" situations such as passing, rounding blind turns in a river, etc.) and channel 16 (distress, safety and calling frequency).

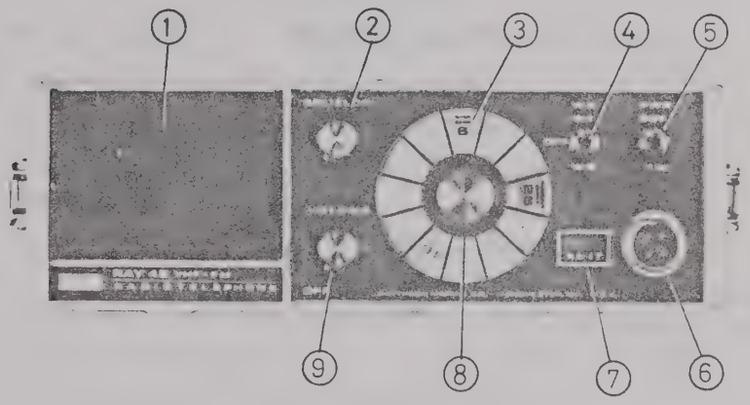


Figure 1-1 Front Panel Controls and Indications

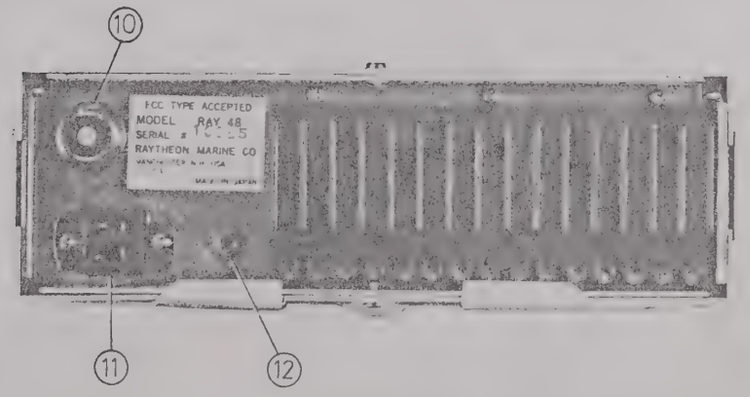


Figure 1-2 Rear Panel Connectors

Audio response	6 dB pre-emphasis 300-3000 Hz +1, −3 dB.
Audio roll-off filter	Exceeds FCC requirements of 18 dB per octave beyond 3000 Hz.
Spurious and harmonic radiated output	At least 60 dB below rated carrier output (52 ohm antenna)
Hum and noise level	At least 40 dB below rated carrier output

Receiver

Channels	Fourteen, with crystals for 6, 16 and W2 weather channels furnished.
Frequency range	156.3 to 157.025 MHz and 161.6 to 162.55 MHz
Frequency stability	0.001 % (−) 20° to (+) 50 ℃
IF frequency	16.9 MHz 1st IF and 455 kHz 2nd IF
Sensitivity	
20 dB quieting	0.5 μV
12 dB Sinad	0.35 μV
Modulation acceptance	14 kHz
Squelch sensitivity	Not more than 0.5 μV
Audio output	3 watts or more at 10% or less distortion 8 ohm load.
Adjacent channel selectivity and desensitization	At least 80 dB
Spurious resonse	Greater than 50dB

Operating voltage requirements

Input voltage	13.8 volts DC (nominal)
Operating range	11.6 to 15.9 volts DC steady operating band

Input current

Receive mode (no signal-squelched)	167 mA
Receive mode (no signal-unsquelched)	165 mA
Transmit	5.0 A
CRYSTAL OVEN	100 mA (average)

Dimentions

Height	2-2/3 inches
Width	8 inches
Depth	10 inches
Weight	5 lbs

1.4 LICENSING

Station license

A Ship License may be obtained by one of two methods: (1) by sending a properly executed application (FCC For 502) directly to the Secretary, Federal Communications Commission, Washington, D.C. 20554, Where this may result in a waiting period of several days an alternate and faster method is to: (2) present the application to your nearest FCC field office, in person, and request an Interim Ship Station Linence. The interim license, which is valid for six (6) months, will be granted immediately provided the formal application is properly executed. Your dealer or serviceman will assist you in completing the application form. Technical information has been filed with the FCC by the manufacturer, so it is only necessary to refer to the model number and maximum rated power on the application. Operate your radio only when you have a valid station license, and keep the license posted on board your boat.

Operator's License

An operator's license may be obtained by applying to the local office of the FCC for a Restricted Radiotelephone Operator's Permit. Use FCC Form 753A. Operate your radio only when you have a valid permit, or if someone else on board has one.

FCC Rules, Parts 83 and 81

Observance of Parts 83 and 81 of the commission's rules is necessary for the radiotelephone communications system to provide its full advantages.

FCC Field Offices

Mailing addresses for commission field offices are listed below. Street addresses can be found in local directories under "United States Government". Address all communications to "Engineer in charge".

Alabama 36602 Mobile
Alaska 99501
P.O. Box 644, Anchorage
California 90014, Los Angeles
California 92101, San Diego
California 94126, San Francisco
California 90731, San Pedro
Colorado 80202, Denver
District of Columbia
20554, Washington
Florida 33101
P.O. Box 150, Miami
Florida 33606, Tampa
Georgia 30303, Atlanta
Georgia 31402,
P.O. Box 77, Savannah
Hawaii 96808, Honolulu
Illinois 60604, Chicago
Louisiana 70130, New Orleans
Maryland 21201, Room 819
Federal Building, Baltimore
Massachusetts 02109, Boston
Michigan 48226, Detroit
Minnesota 55102, St. Paul
Missouri 64106, Kansas City
New York 14203, Buffalo
New York 10014, New York
Oregon 97205, Portland
Pennsylvania 19106, Philadelphia
Puerto Rico 00903, San Juan
Texas 77704
P.O. Box 1527, Beaumont
Texas 75202, Dallas
Texas 77002, Houston
Virginia 23510, Norfolk
Washington 98104, Seattle

Station Log

The law states that a station log shall be maintained during the hours of service of ship stations using a radiotelephone. The first entry in the log should be the installing technician's statement to the effect that the transmitter frequency and modulation have been checked. Several pages of log charts are provided at the end of this manual.

1.5 THE MARINE RADIOTELEPHONE SERVICE

The radiotelephone communications system is designed to serve these primary functions, in order of priority:

1. Safety (channel 16): The international calling and safety channel is the keystone of the radiotelephone system. To insure that a maximum number of stations monitor this frequency, international regulations authorize its use for calls and replies.
2. Operational (channel 6): Concerned with the exchange of information pertaining to navigation, movement and operation of vessels.
3. Business (channel 26): Concerned with the handling of general communications between vessels, and with points on land via commercial shore stations providing extended telephone usage.

As a part of the marine safety and communications system, this radiotelephone can provide immediate contact with others wherever you may be.

When imminent danger threatens and immediate help is required, use the international distress signal MAYDAY on channel 16 (repeated three times) followed by the name of your vessel. Announced on this channel, it will be heard by nearby boats as well as Coast Guard and commercial shore stations within range. Announced on a working channel of the shore stations in the area, it will permit direct connection to the proper agency on land. Upon acknowledgement, state your boat's name, your location, nature of trouble and assistance required.

For less serious situations than those warranting a MAYDAY call, you can talk with a nearby boat over a ship-to-shore frequency; or with any agency on land via a working frequency of a commercial shore station. Indicate that you are in trouble and your call will be given precedence.

While your set is turned on, keep the receiver adjusted for standby on channel 16 (156.80 MHz) so that you will be in a position to help others; they are doing the same for you. This watch may be interrupted when you are communicating with another boat or with a shore station. When possible, limit calls to essential conversations, as others may be waiting.

When you hear an emergency call from another vessel, it is your obligation to terminate any communication which would interfere with the emergency communication, and to render any assistance possible.

Always give precedence to distress or other urgent calls.

Marine radio frequencies are few in comparison with the number of vessels equipped with radiotelephones. When you use one of these frequencies, you are using a gigantic party line. Cooperation is necessary so that all may have equal opportunity to place and receive calls.

The VHF-FM band, from 156.275 to 162.55 includes 39 channels for use in the United States, its coastal waters, and the weather bureau station. See table 1-2 for allocations of available VHF channels. Other channels will be allocated as necessary.

The weather bureau has VHF-FM radio transmitting facilities on 162.40 and 162.55 MHz. Crystals for both these frequencies are installed in your receiver in positions W1 and W2 of the WEATHER MONITOR switch. Additional stations are being put into service by the weather bureau. Contact your local office for additional up-to-date information.

RULES TO REMEMBER

YOUR RADIO CAN MEAN YOUR SAFE ARRIVAL — USE IT WITH RESPECT.

The following are some important points of proper usage recommended by the Radio Technical Commission for Marine Services, Washington, D.C. Numbers in parentheses refer to paragraph in FCC Rules, Part 83.

BE SURE TO GIVE NAME AND POSITION OF VESSEL.

Emergency Situations

Distress	MAYDAY — MAYDAY — MAYDAY
Urgency message concerning safety of vessel or person(s)	PAN — PAN — PAN
Safety of navigation or important weather information	SECURITY — SECURITY — SECURITY
1. Maintain Your Watch	Listen to channel 16 when not in communication with another vessel (83.223).
2. Listen Before You Talk	Avoid interference with calls in progress (83.181).
3. Identify Your Vessel	Give your call sign and vessel name at beginning and end of each communication (83.364).
4. Make Calls Correctly	Call other vessels on channel 16 then switch to intership channel (83.366). Call public shore stations, in general, on an appropriate working channel (83.366).
5. Use Channels Properly	Channel 16 for emergencies and brief calls and replies (83.353). Intership (channel 6) for safety, operational or business communications (83.358).
6. Watch Your Language	Use of profane or obscene language is a criminal offense.
7. Be Brief At All Times	Limit calls to 30 seconds; Conversations to 3 minutes (83.366).
8. Keep An Accurate Log	Make entries as required by(83.366).
9. Have Documents Handy	Ship Station License; Operator License or permit; Part 83 of FCC Rules; Log Book (83.367).

Table 1-2 VHF Channel Designators

Channel Designator	Frequency		Points of Communications	Authorized Communications
	Ship	Coast		
65	156.275	156.275	Ship-ship/ship-Coast	Port Operations
06	156.300		ship-ship	Intership Safety
66	156.325	156.325	Ship-ship/ship-Coast	Port Operations
07	156.350	156.350	Ship-ship/ship-Coast	Commercial
67	156.375		Ship-ship	Commercial
08	156.400		Ship-ship	Commercial
68	156.425	156.425	Ship-ship/ship-Coast	Non-Commercial
09	156.450	156.450	Ship-Coast	
69	156.475	156.475	Ship-Coast	Non-Commercial
10	156.500	156.500	Ship-ship/ship-Coast	Commercial
70	156.525		Ship-ship	Non-Commercial
11	156.550	156.550	Ship-ship/ship-Coast	Commercial
71	156.575	156.575	Ship-Coast	Non-Commercial
12	156.600	156.600	Ship-ship/ship-Coast	Port Operations
72	156.625		Ship-ship	Non-Commercial
13	156.650	156.650	Ship-ship/ship-Coast	Navigational
73	156.675	156.675	Ship-ship/ship-Coast	Port Operations
14	156.700	156.700	Ship-ship/ship-Coast	Port Operations
74	156.725	156.725	Ship-ship/ship-Coast	Port Operations
15		156.750	Coast-ship	Environmental
16	156.800	156.800	Ship-ship/ship-Coast	Distress, Safety & Calling
17	156.850	156.850	Ship-ship/ship-Coast	State Control
77	156.875		Ship-ship	Commercial
18	156.900	156.900	Ship-ship/ship-Coast	Commercial
78	156.925	156.925	Ship-Coast	Non-Commercial
19	156.950	156.950	Ship-ship/ship-Coast	Commercial
79	156.975	156.975	Ship-ship/ship-Coast	Commercial
20	157.000	161.600	Ship-ship/ship-Coast	Port Operations
80	157.025	157.025	Ship-ship/ship-Coast	Commercial
24	157.200	161.800	Ship-Public Coast	Public Corres.
84	157.225	161.825	Ship-Public Coast	Public Corres.
25	157.250	161.850	Ship-Public Coast	Public Corres.
85	157.275	161.875	Ship-Public Coast	Public Corres.
26	157.300	161.900	Ship-Public Coast	Public Corres.
86	157.325	161.925	Ship-Public Coast	Public Corres.
27	157.350	161.950	Ship-Public Coast	Public Corres.
87	157.375	161.975	Ship-Public Coast	Public Corres.
28	157.400	162.000	Ship-Public Coast	Public Corres.
88	157.425		Ship-ship	Commercial

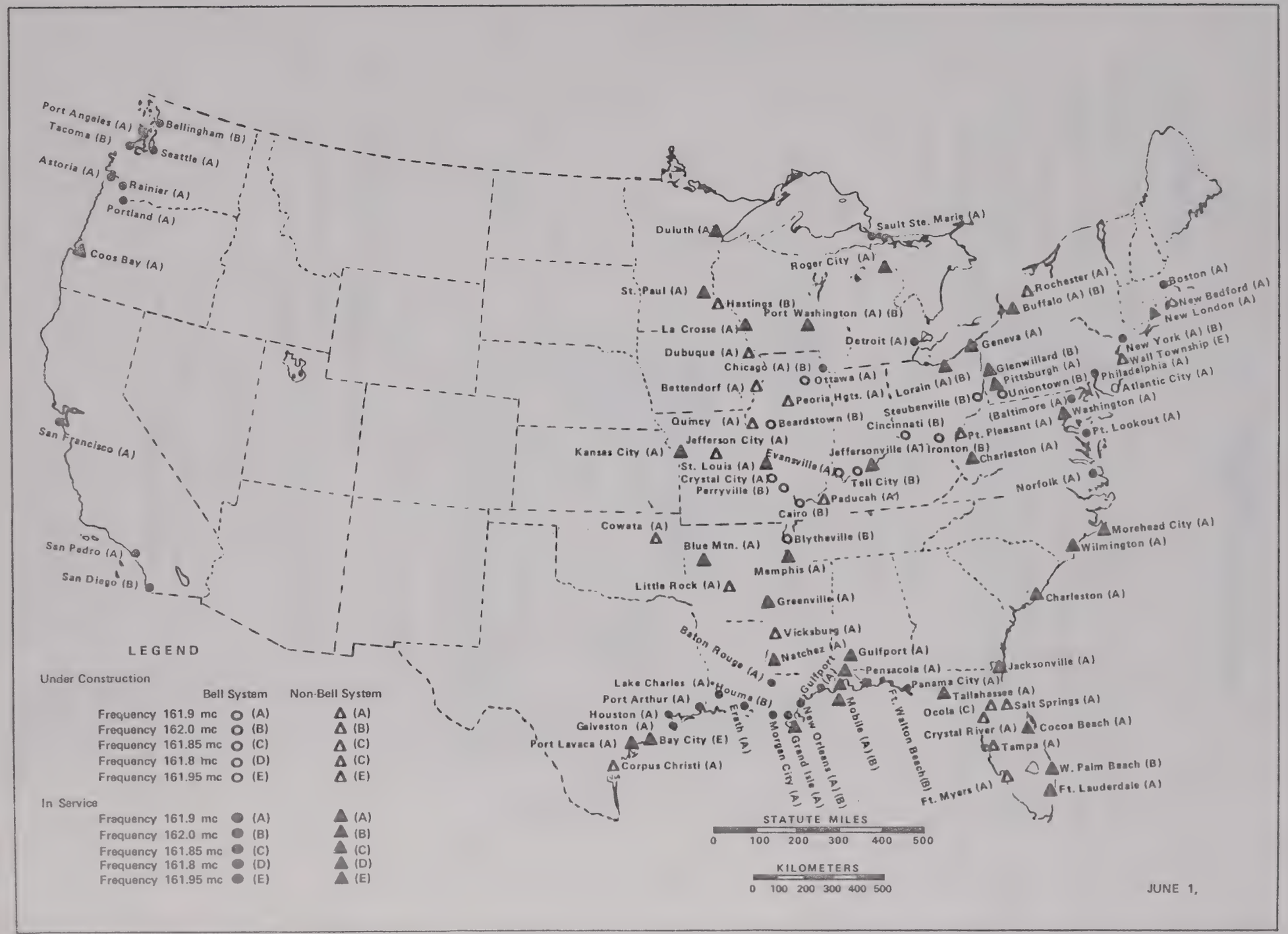


Figure 1—3 Chart of US VHF Stations

2. INSTALLATION

2.1 GENERAL

Care in planning the installation of a marine radiotelephone can contribute much toward insuring that maximum performance, utility, and trouble-free operation is obtained from the equipment. In planning the installation, consideration should be given to the following.:

1. The location of the unit should be chosen to provide easy access to the microphone and controls, and maximum protection from salt spray or splashing water. A horizontal shelf is the most compatible type of the mounting for the bracket furnished with the radio (reference figure 2-2).
2. Proper routing of the power and antenna cabling.

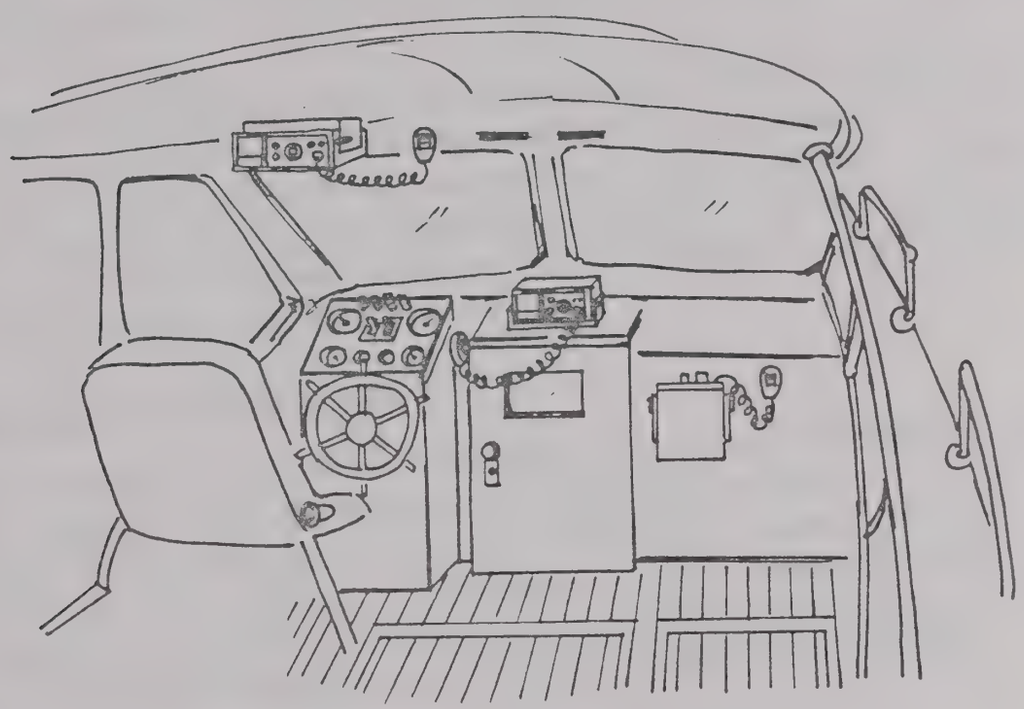


Figure 2-1 Typical Mounting Locations

2.2 ELECTRICAL CONNECTIONS

Connect the positive lead (RED) of the power cord to the battery (+).
Connect the negative lead (BLACK) to the battery (−).

CAUTION

Do not install this radio on a vessel with
a positive-ground battery system.

2.3 ANTENNA

Any of the following Webster antennas are suitable for use with this radiotelephone.

Antenna Model	Gain (dB)	Coax Length (feet)
M-51	3	15
M-68	3	20
M-69	6	20
M-70	9	21
M-71	3 (Sailboat)	50

The transmitting or receiving range may be extended by either or both of the following:

1. Increase the mounting height of the antenna.
2. Use an antenna with a higher gain.

Following both recommendations can substantially increase range. The dealer from whom the radiotelephone was purchased can advise as to the best antenna/mounting configuration for a particular application.

Mounting instructions and hardware are furnished with the antenna. If the cable length required is greater than that supplied, it is recommended that RG-8/U cable be used. If the mounting surface selected (deck or cabin top) does not have sufficient strength to support the antenna during heavy weather it may be reinforced with a plywood backing plate. If an antenna other than Webster M51 is used, an FCC-licensed technician must be employed to tune the antenna for the lowest VSWR and retune the radio to the new antenna.

2.4 BONDING OF METALWORK

All unbonded metalwork in the vicinity of the antenna, such as hand rails, steering cables, permanent halyards, windshield frame or plumbing can affect the performance of the radio. It is good practice to bond these together and ground to the engine with a heavy conductor and suitable clamps. In some cases, this bonding will be essential, since any unbonded metalwork may act as a parasitic absorber or re-radiator of the antenna transmit signal. These parasitic elements may severely distort an otherwise excellent antenna pattern. BOND ALL METALWORK.

2.5 ADDITIONAL CHANNELS

Installation of crystals, adjustments, tune-up and other requirements to activate additional channels must be performed by an FCC-licensed technican.

2.6 HIGH/LOW POWER

To conform with the latest FCC directives, this radio can be operated in either the high or low power mode on all channels depending on the position of the function switch.

2.7 MICROPHONE AND EXTERNAL SPEAKER

The microphone holder provided with the radiotelephone can be mounted to the case of the unit by removing the paper from the bracket. The bracket has a glue already attached to the metal, and will adhere instantly to the metal case. To mount the bracket at another location, two #6 sheet metal screws are provided. Plug the microphone connector into the microphone jack located on the front panel of the unit.

If an external speaker is to be installed, connect the speaker (8-ohm impedance and more than 3 watts input power) to the plug provided with the unit. Connect the external speaker plug into the external speaker jack located on the rear of the unit.

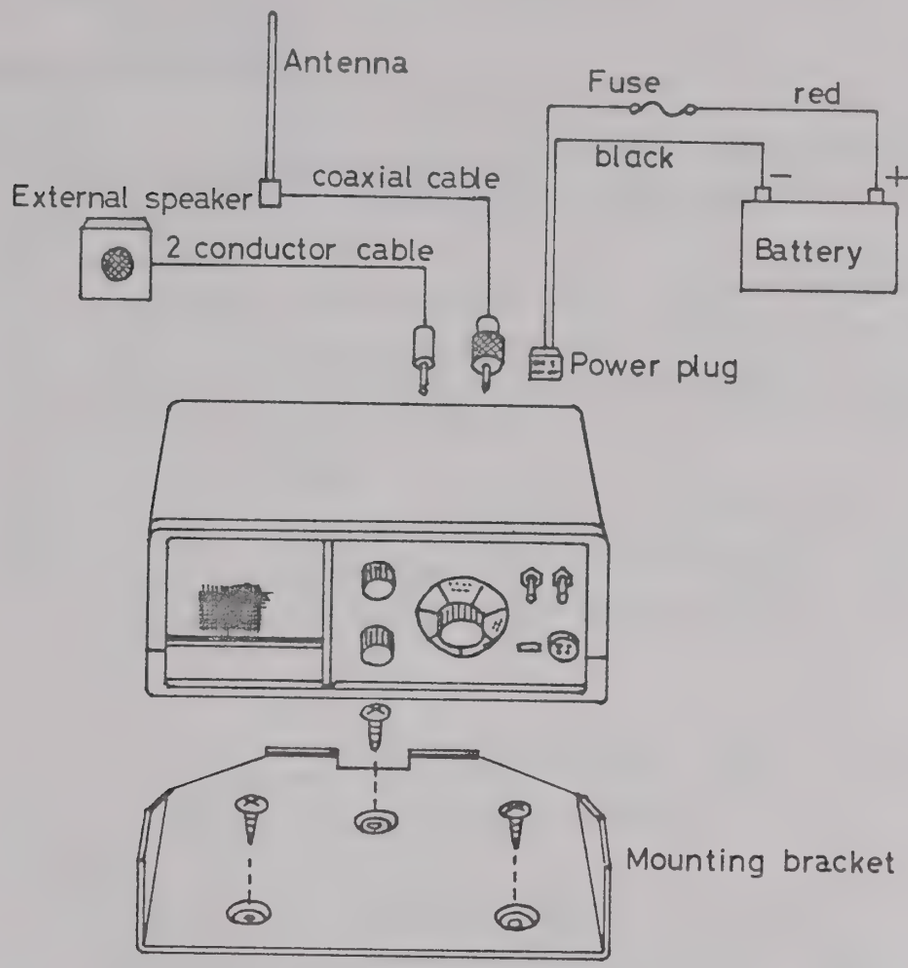


Figure 2-2 Installation of the radiotelephone

3 OPERATION

3.1 CONTROLS AND INDICATORS

Unit controls and indicators have been identified in figure 1-1, 1-2 and table 1-1.

3.2 OPERATING PROCEDURE

3.2.1 To Receive:

1. Rotate VOLUME control clockwise and adjust for a comfortable listening level.
2. Set the channel selector to the desired operating channel and readjust the VOLUME control as necessary.
3. Adjust the SQUELCH control clockwise slowly until the background noise is just muted. This should be done when there are no signals being received. It is important that this control be adjusted just to the threshold point, so that a weak signal will still be audible. When a transmission is made, it will trip the squelch circuit, allowing the signal to be heard.
4. Weather reports are continuously available on either W1 or W2 position of the WX control. Either position overrides all other receive channels, so it is necessary to return the WX selector to the OFF position to again receive or transmit normal communications.

3.2.2 To Transmit:

1. Select the desired channel and listen carefully to assure that it is not busy. If it is busy you will hear voices or an intermittent busy tone. Do not interrupt unless an emergency situation exists.
2. If the channel is clear, press the PUSH-TO-TALK button on the microphone to activate the transmitter. Announce the name of the boat you are calling and its call letters (if available), followed by the name of your boat and your call letters. Repeat if necessary. Release the microphone button to receive a reply. At the end of the conversation announce that you are signing off and again give the name and call sign of your boat.

   Your transmitter is in operation only when the microphone button is depressed, and only then can others hear you. The receiver functions only when the button is released, and only then can you hear others.

4. THEORY OF OPERATION

4.1 RECEIVER (refer to Figure 4-1, System Block Diagram)

This unit provides RF amplifier of a dual gate MOS field effect transistor and double tuned tank coil. Totally, 4 broad banded tuned circuit provide 7 MHz pass band with separation for undesired signals.

The first converter (156 to 163 to 16.9 MHz) consists of a dual gate FET (Q102) with signal applied to gate #1 and local frequency injection to the same gate. The 16.9 MHz 1st IF output of the first converter is fed through a 16.9 MHz crystal filter via T106 tuned coil. The crystal filter has a 6dB bandwidth of 13 kHz to the 16.9 MHz IF stage (Q106). The output of first IF is fed to the base of the second mixer (Q107). The second local oscillator (Q108) operates at 16.445 MHz and its output is also fed to the second mixer.

The 455 kHz output from the second mixer is fed through T109 to the input of a integrated circuit IF amplifier (Q109). The 455 kHz output of Q109 drives a double-diode discriminator. The audio output of the discriminator is amplified by audio amplifier of Q113 and Q114.

The first converter (Q102) receives its local injection from the crystal oscillator (Q103) and multiplier (Q104) circuit. The multiplier transistor functions as a tripler with an output frequency below the channel frequency. Following Q105 is local injection amplifier for giving sufficient injection voltage to the converter with minimum unwanted harmonics.

The audio output from the discriminator is fed to the squelch amplifier and audio amplifier through the volume control. Audio output is obtained by the audio IC to the 8-ohm loud speaker.

The squelch circuit consists of the front panel squelch control (VR101), noise amplifier (Q110) and two triggering transistors (Q111, 112). The squelch circuit operates by detecting the effect a received radio signal has upon the noise output of the discriminator. In absence of a radio station signal, maximum noise is present at the output of the discriminator. When a radio station signal is received, this noise level is reduced in proportion to the strength of the signal. The sensitivity of the squelch circuit is controlled by the setting of the front panel squelch control and the squelch level control (VR102) on the PC board.

When no radio station signal is being received the noise output from the discriminator is fed through the two squelch controls to the input of the noise amplifier (Q110). The amplified noise output is applied to the base of the trigger transistor (Q111) causing it to conduct. When Q111 conducts, forward bias is removed from Q112, thereby turning it off. When Q112 is turned off, a positive voltage is applied to the emitter of the first audio amplifier (Q113) turning it off and silencing the loud speaker.

When a radio station signal is received, the noise input to Q110 is reduced causing transistor Q111 to turn off. When Q111 is off, Q112 is forward biased ON thereby removing the positive voltage applied the emitter of audio amplifier transistor (Q113) and permitting the audio signal to pass through to the loud speaker.

4.2 TRANSMITTER (refer to Figure 4-1)

The transmitter crystal oscillator transistor (Q201) uses 6.5 MHz fundamental cut crystals. The oscillator output is coupled to the modulator circuit. The modulated signal by the audio signal from the audio section is fed to next straight amplifier (Q203) and tripled by Q204. Then the 19.5 MHz output from the tripler is inductively coupled to the following doubler Q205. The doubled 39 MHz output is coupled to the next doubler circuit in the same method, and that doubled 78 MHz output to the next doubler circuit. The final channel frequency is obtained by the last multiplier (Q207). All multiplier circuits consist of a transistor and double tuned tank coil to eliminate the unwanted order of harmonics. The output from the last doubler is fed to the following predriver amplifier (Q208), amplified, and then coupled to the second predriver. The second predriver, driver and power amplifier transistor (Q209, 210, 211) are located on the RF power amplifier PC board. The output of the power amplifier is coupled to the 50-ohm antenna through the antenna filter and relay.

The transmitter audio amplifier circuitry consists of a dynamic microphone, an IC, an instantanous speech clipper and an audio roll off filter.

The RF power reduction is made by reducing the dc voltage supplied to the driver and power amplifier. The 25W and 1W power change circuit consists of change over switch and voltage control VR204. When the switch is in the "25W" position the DC source power is directly supplied to the RF circuit, when in the"1W" position the dc voltage is reduced so that the RF power output is within 1 watt.

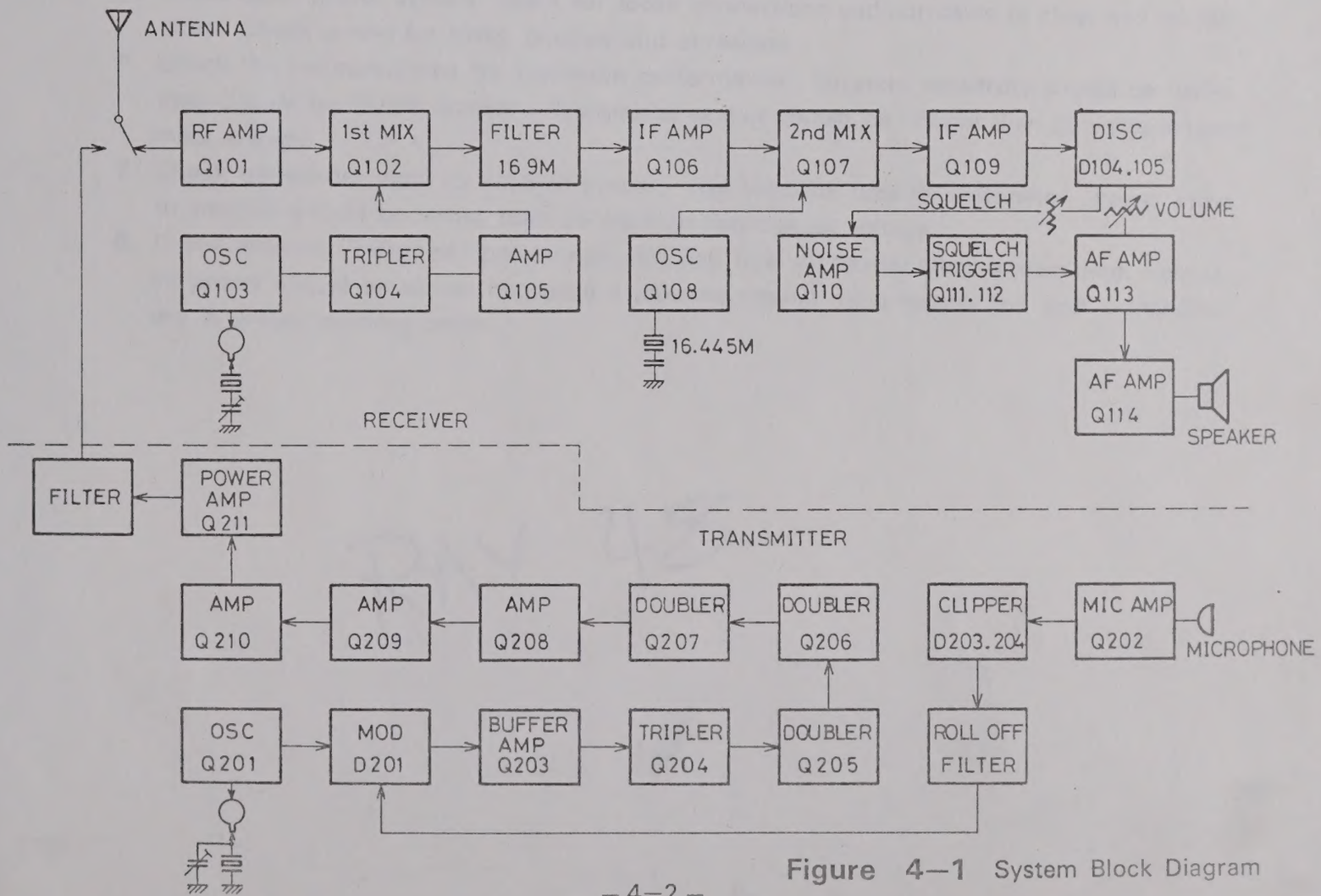
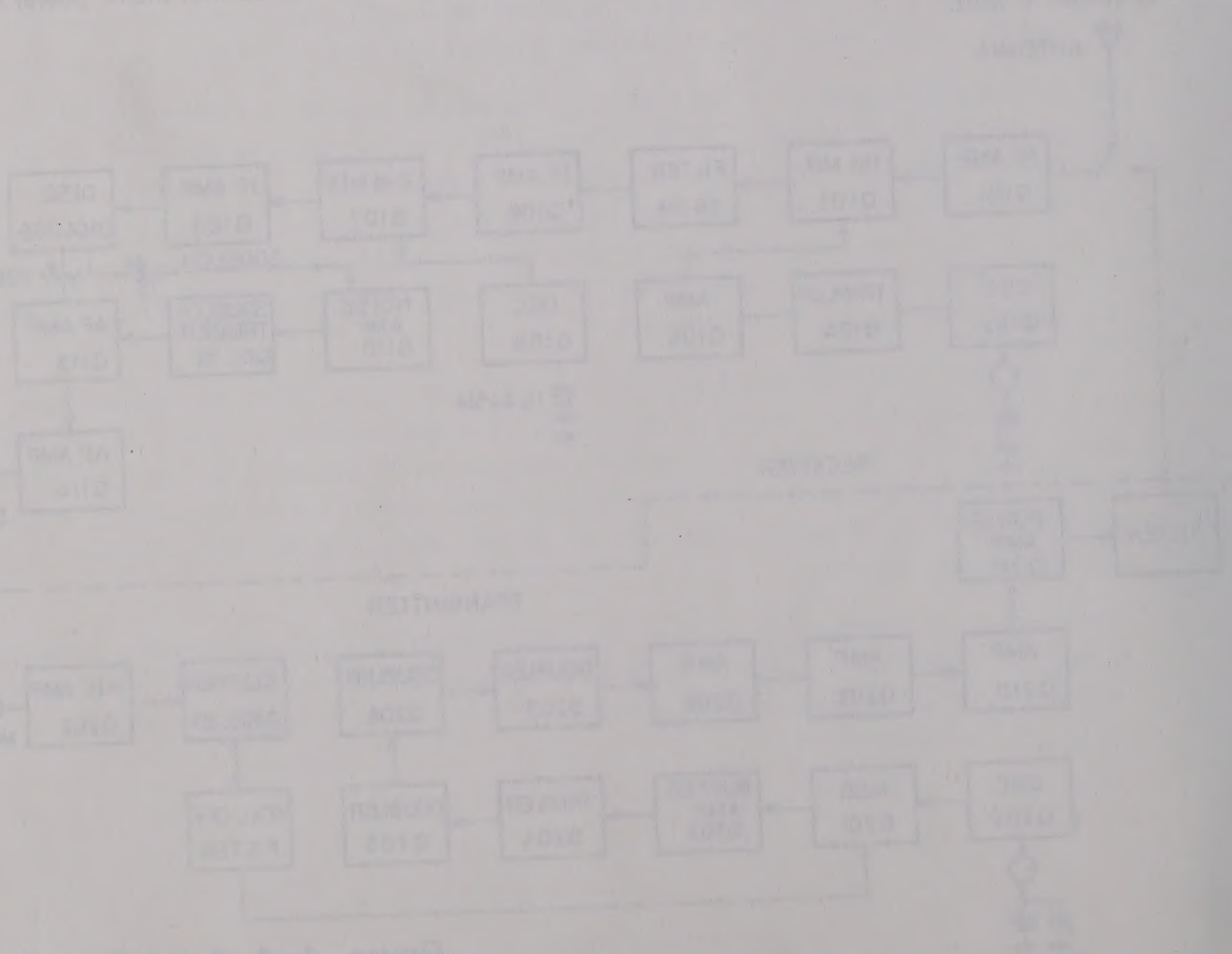


Figure 4—1 System Block Diagram



5 MAINTENANCE

5.1 GENERAL

Periodic checks should be made by properly qualified technical personnel to assure optimum performance. Since the receiver is considerably different in its circuit design from conventional marine receivers, no attempt should be made to service the equipment until a thorough understanding of the basic circuit, and the characteristics of the radiotelephone are acquired. Servicing may be simplified by reference to the schematic drawings at the end of the manual. The approach is to localize the cause of trouble and eliminate those sections of the equipment which are operating normally.

5.2 BASIC MAINTENANCE PROGRAM

To ensure maximum performance, a routine program of preventive maintenance should include the following points.

1. Check plugs, connectors and fastener for proper seating.
2. Remove any accumulated dust with small brush or dry compressed air.
3. Check battery connections. Add water and clean terminals as required.
4. Check the antenna system carefully. Look for corroded coaxial plug or socket connections. Check isolation of center coax conductor and outer shield. Check resistance between connections.
5. Check input power system, check for loose connections and corrosion of plugs and receptacles. Check wiring for kinks, pinches and abrasions.
6. Check the radiotelephone for maximum performance. Receiver sensitivity should be better than 0.5 μV for 20 dB quieting. Transmitter output should be better than 25 watts at rated input voltage.
7. Check transmitter input to antenna system. Use thru-line type RF wattmeter. Power input to antenna should be better than 25 watts at rated input voltage.
8. Check antenna "reflected" power with thru-line type wattmeter when transmitting. Reflected power should be almost negligible if antenna coaxial transmission line and transmitter are in proper working order.

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